

Vegetable Species in the Palm Grove of The Ouargla Region (Algeria)

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Abstract. The present work on the cultivation of winter vegetable species, which was carried out in the perimeters of development of the six communes of the region of Ouargla. We found that the biodiversity recorded is 16 species and 09 botanical families, during the study period. The most frequent botanical families are : Liliaceae (*Allium cepa* L.), Chenopodiaceae (*Spinacia oleracea*.), Asteraceae (*Lactuca sativa*) and Apiaceae (*Daucus carota* .). Many local cultivars have been identified; their identification is mainly based on: the origin of the seeds, the shape and color of the fruits. According to the average richness and diversity index calculations, we found that the stations of Sidi Khouiled and Hassi Ben Abdallah have a great diversity, unlike Rouissat and Ouargla where the diversity is low. The local diversity seems to be threatened, this is due to several causes among others the non-reasoned selection of local cultivars and the introduction of hybrid seeds which allows us to validate the first hypothesis that says (the development projects have favored the introduction of many new vegetable species, not traditionally cultivated in the areas and have favored the use of hybrid varieties, with high production potential. This policy induces a genetic erosion, especially for local cultivars) and to reject the second hypothesis that says (the development perimeters participate in the preservation of local cultivars, which ensures their sustainability in the medium and long term).

Keywords. Vegetable crops, Palm grove, Ecological indices, Ouargla.

I. INTRODUCTION

Algerian oases have been the cradle of know-how, creativity and continuous adaptation that have led to the creation of sites of great biological diversity. There is an exceptional diversity of date palms and associated crops such as tree species, cereals, vegetables, fodder, aromatic and medicinal. These crops are generally intended to satisfy family needs and local markets [1-10]. Agriculture in the Ouargla region has undergone, in recent decades, a very remarkable development in terms of agricultural areas, which are being extended thanks to the development of new perimeters and in terms of crop diversity in crop production systems, which tends more and more towards intensive agriculture. This calls for the use of new techniques to ensure good production, in quantity and quality. In this region, agriculture is characterized by two agricultural systems: the old system, defined by the oases and the new system, represented by the new land development perimeters; carried out under the various development programs. [7]. The wilaya of Ouargla has an agricultural area of 4,877,393 ha of which only 31162 ha, are currently exploited [3]. The various agricultural development programs, launched since independence, have doubled the number of date palms. The vegetable crops species have a great food and economic importance. The wilaya of Ouargla has 811 ha of vegetable crops, in irrigated, that of the region is about 191 ha, or about 24% [8]. Our objective is the identification of diversity among vegetable species grown in the development perimeters of the Ouargla region. The study will also analyze the importance of introduced varieties and the place of local cultivars that may exist in the region.

Two hypotheses are put forward:

- The development projects have favored the introduction of many new vegetable species, not traditionally cultivated in the areas, and have favored the use of hybrid varieties, with high production potential. This policy leads to genetic erosion, especially for local cultivars;

→ The development perimeters participate in the preservation of local cultivars, which ensures their medium- and long-term sustainability.

II. MATERIALS AND METHODS

• Choice of Study Stations

To study the biodiversity of vegetable species in the region of Ouargla, we based ourselves on the statistics of the Direction of agricultural Services [7] to choose the study sites. We were interested in stations with high and low potential for vegetable crops. Our surveys were carried out in six large market gardening stations in the region of Ouargla, namely: daïra of Ouargla (municipality of Ouargla and municipality of Rouissat), daïra of N'goussa (municipality of N'goussa) and daïra of Sidi Khouiled (municipality of Sidi Khouiled, municipality of Ain Beida and municipality of Hassi Ben Abdallah). The size of the majority of farms surveyed is medium (1ha-3ha).

• Sampling Method

Sampling consists of selecting elements in order to obtain objective information with a measurable precision on the whole. [9]. According to GOUNOT (1969), subjective sampling is the simplest and most intuitive form. The principle consists in choosing, as samples, areas that seem particularly homogeneous and representative of the plots [9]. For our study, we chose 10 farms in each station. In each of them, we carried out 03 surveys. The choice of these surveys was based on the diversity of species, the sampled surface is 100 m².

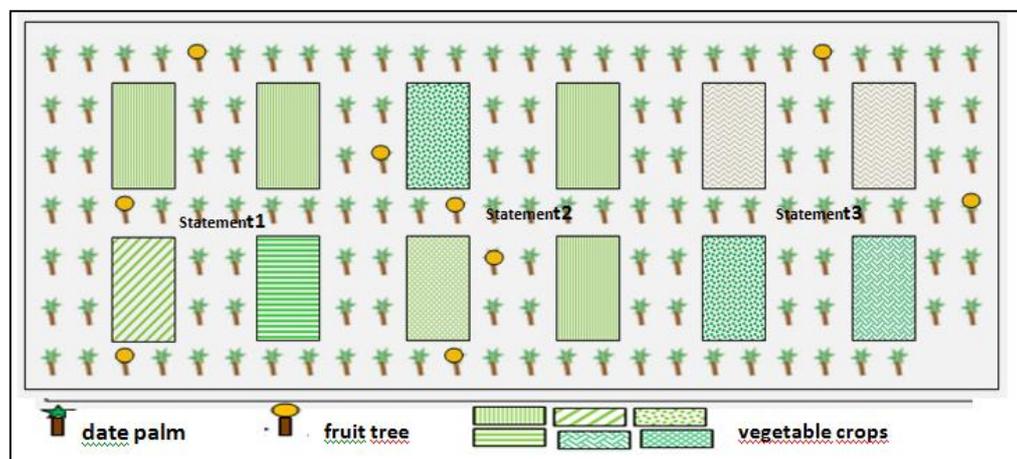


FIGURE 1. Distribution of statements at the farm.

• Exploitation of the Results by Ecological Indices

To express the results of our study, we used ecological indices: Total richness (S), Shannon-Weaver diversity index and equi-repartition index.

III. RESULTS AND DISCUSSION

• Percentage of Occupation of the Market Garden Species in the Region of Ouargla

In order to have an idea on the distribution of market garden species in the region of Ouargla and their importance, we were interested in the analysis of statistical data collected at the level of the Directorate of Agricultural Services of the wilaya (DSA), during 10 years (2006 - 2015) [7]. The diversity of species in the 06 communes seems to be different. The most diverse are: N'goussa, Hassi Ben Abdallah and Sidi Khouiled. The commune of Ouargla has relatively low percentages of occupation compared to the other communes (Figure 2)

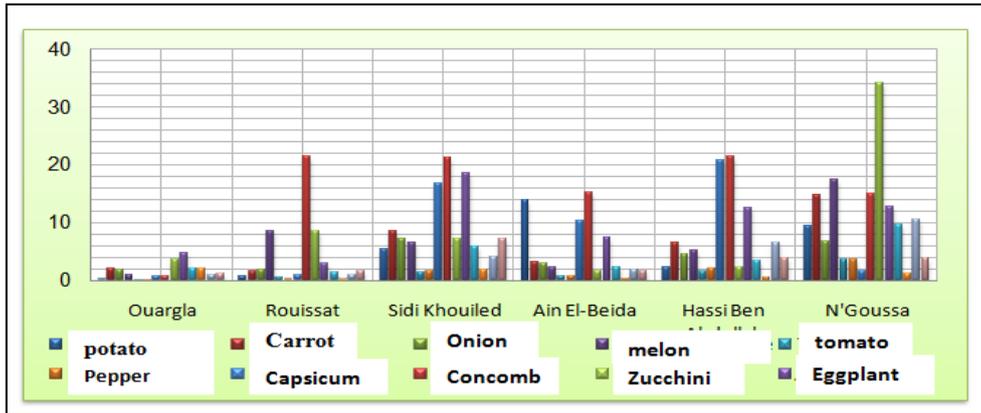


FIGURE 2. Percentage of occupation of vegetable crops species in the region of Ouargla [7].

- Use of the Indices Applied to Market Garden Species
- Total Richness

Hassi Ben Abdallah is an area, very well known in Ouargla, by its cultivation of market garden species [4]; since the creation of the perimeter in 1969. The presence of an ITDAS station, whose first shift is market gardening, is a testimony to this. On visualizing figure 03 the total richness in the station of N'goussa is of 11, the station of Ain Bieda, the total richness is of 12 species, for the station of Rouissat, the total richness is of 08 species, in the station of Ouargla, the total richness is of 08 species. This variation in richness values is related to many factors: farm size, irrigation, level of education of farmers and the availability and quality of labor. The communes of Sidi Khouiled, Hassi Ben Abdallah and N'goussa appear to have significant wealth. Indeed, these are areas with agricultural vacation. The ecological conditions are very favorable (especially the availability and good quality of irrigation water) to the installation of crops. The submersion irrigation system (by seguia) is used mainly for species cultivated in the open field (onion, carrot, spinach, ...); whereas drip irrigation is used for crops under cover (tomato, pepper, ...).

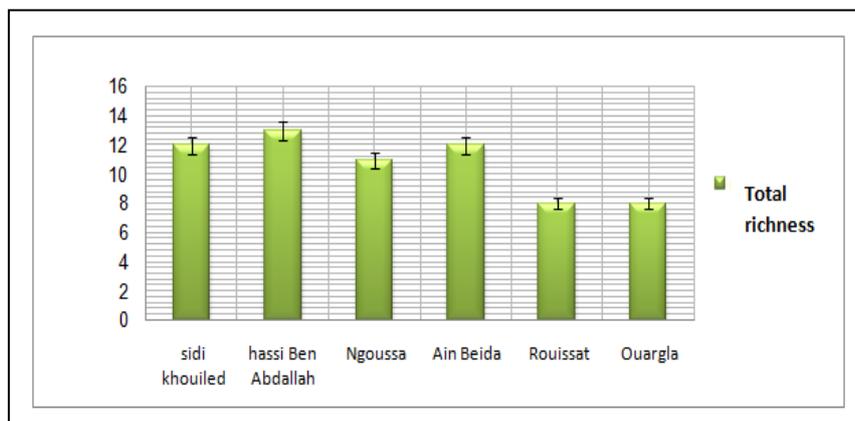


FIGURE 3. Total richness of the studied stations.

The results of the survey on vegetable crops grown in the Ouargla region (for the six stations) are presented in Table 01.

TABLE 1. Main vegetable species cultivated in the Ouargla region.

Family	Scientific name	Name vernacular	Name Arabic	Name Local
Chenopodiaceae	<i>Spinacia oleracea L.</i>	Spinach	سبانخ	سلاق
	<i>Beta vulgaris L.</i>	Beet	شمندر	بيطرف
Liliaceae	<i>Allium cepa L.</i>	Onion	بصل	بصل
	<i>Allium sativum L.</i>	Garlic	ثوم	ثوم
Solanaceae	<i>Capsicum annuum L.</i>	Pepper	فلفل	فلفل
	<i>Lycopersicum esculentum L.</i>	Tomato	طماطم	طماطم
	<i>Solanum tuberosum L.</i>	Potato	بطاطس	بطاطا
Brassicaceae	<i>Solanum melongena L.</i>	Eggplant	بادنجان	دنجال
	<i>Brassica rapa L.</i>	Turnip	لفت	خردل
	<i>Raphanus Sativus L.</i>	Radish	فجل	راضي
Cucurbits	<i>Cucurbita pepo L.</i>	Zucchini	كوسة	جربوات
Fabaceae	<i>Vicia faba L.</i>	Fava	فول	فول
	<i>Pisum sativum</i>	Peas	بازلاء	جليانة
Portulacaceae	<i>Portulaca oleracea L.</i>	Purslane	الرجلة	بندراق
Apiaceae	<i>Daucus carota L.</i>	Carrot	جزر	سنارية
Asteraceae	<i>Lactuca sativa L.</i>	Lettuce	الخس	سلاطة

Overall, the inventories of species found in the region of Ouargla seem to be the same identified by [1], this can be explained by the similarities in the dietary habits of the Saharan populations and where vegetables have a capital importance. Culinary preparations between the two regions are more or less similar.

Most cultivated species do not have well-defined varieties or cultivars. The seeds used are often from a mixture of populations, grown locally and selected more or less empirically by the farmers. These populations are inherited from generation to generation. In any case, local names are often given to certain cultivars of species in order to express one or more characteristics of the plants such as: the origin of the seeds, the shape of the leaves, the color of the fruits. For this purpose, farmers give names to different populations based on (4) criteria:

→ According to the origin of the seeds; to distinguish between species of local or introduced origin. In this case, two classes of populations emerge either:

"Beldi or Arbi", from the Arabic meaning, which means local origin, as the spinach Beldi, found in all stations and the carrot Beldi, also found in all localities, except Ain Beida.

"Frensice", from the Tel meaning, which means origin from the North of the country or introduced from other countries; like the Frensice spinach (Scotola variety from Caste) and the Frensice carrot (super muskade).

→ According to the size of the fruit; case of the pepper; which is distinguished by two populations:

"Tunsie", which means small-sized pepper

"Arbi", which means large pepper.

The hybrid variety of pepper is: Goat horn. It is used in Ain Beida and Sid Khouiled.

→ According to the shape of the fruits; case of the tomato which is distinguished by:

"Nedjma" which means tomato with fruits in the shape of a star.

"Elkesse" which means tomato with fruits of cup.

"Sghira" which means tomato with small fruits.

The hybrid tomato varieties used are Petra, Sereina and Rio Grande. They are used in Hassi Ben Abdallah and Ain Beida.

→ According to the color of the fruits, the case of the potato and the onion which are characterized by :

"Hamra" which means the onion and the potato with red color.

"Baidha" which means onion and potato with yellow color.

The varieties of potatoes, white and red are imported. They are respectively the varieties Spunta (white); Kandor and Bentina (red).

In upper Oued Righ reports that farmers in the Touggourt region also give names to local cultivars of market garden species. The same criteria and modalities were reported (origin, shape and color). [1]

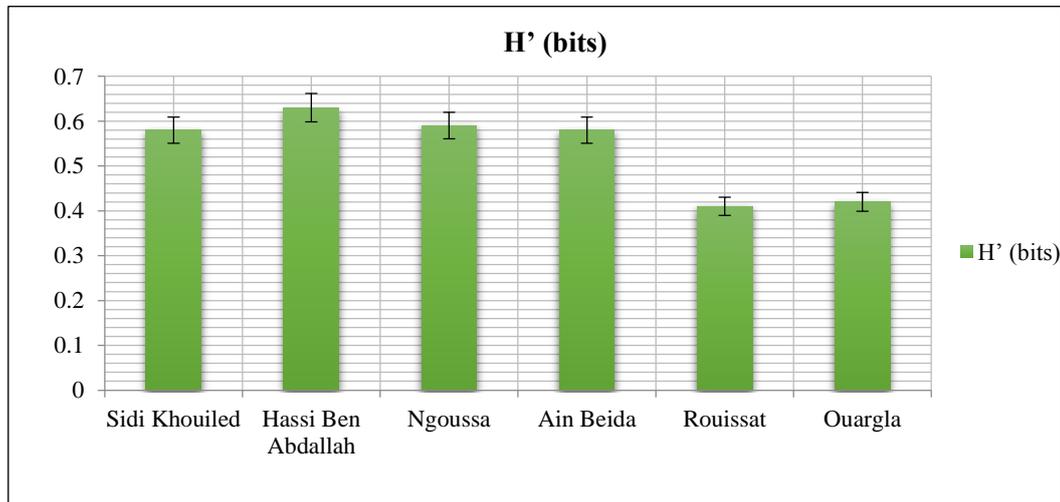


FIGURE 4. Shannon Weaver index of the studied stations.

The maximum average value was recorded in the station of Hassi Ben Abdallah, with 0.63. And the value of H' in the 10 farms is between 0.22 and 0.94. In N'Goussa, the average Shannon Weaver index is 0.59, those of the 10 farms vary between 0.23 and 0.78. N'Goussa could be ranked second after Hassi Ben Abdallah, although the differences are not significant. Sidi Khouiled and Ain Beida have the same index, with 0.58. The value of H' varies from 0.11 to 0.88. The commune of Ouargla has an index of 0.42, the value of H' varies from 0.22 to 0.55. In Rouissat, the Shannon Weaver index is only 0.41. The H' value varies in the farms, from 0.21 to 0.58 (Figure 4).

The values of H' obtained tend towards 0, this expresses a very low diversity (close to 0.4) [11]. This classification is used for floristic and faunistic biodiversity.

- **Use of the Equirepartition Index**

The degree of diversity reached in relation to the theoretical maximum was calculated using the equirepartition index [2]. The results are shown in Table 02.

TABLE 2. Equirepartition indices of the studied stations.

Stations	Sidi Khouiled	Hassi Ben Abdallah	Ngoussa	Ain Beida	Rouissat	Ouargla
H'max (bits)	3.6	3.16	3.31	3.61	2.4	2.4
E	0.16	0.16	0.18	0.16	0.17	0.17

The equitability indices obtained vary from 0.18, in N'goussa station to 0.16 in Ain Beida, Hassi Ben Abdallah and Sidi Khouiled stations. No value is close to 1, which shows that the equitability is low at all stations studied. The equitability index tends towards 0 because most of the farms are based on the cultivation of one or two main species, the others are considered as secondary or even sometimes marginal species.

- **Problems Encountered and Prospects**

The surveys carried out in the Ouargla region revealed several problems, the most widespread at the level of farms are

- The water deficit among several farmers surveyed;
- The high cost of electricity and power cuts;
- The high cost of inputs, such as plant protection products;
- The invasion of weeds, especially phragmites and chient dent
- The invasion of weeds, especially phragmites and chient dent;
- The lack of qualified manpower;
- The high cost of seeds;
- The lack of mechanization;
- The problem of salinity;
- The lack of financial means

As perspectives, farmers do not seem to have a strategy for the preservation of biodiversity or its development. The choice of species and even varieties is dictated by market demand.

Raising farmers' awareness of the need to preserve local cultivars (in situ conservation) is essential. There are also opportunities to exchange plant material between localities in order to encourage a reasoned selection of local cultivars. It is true that the use of hybrid seeds cannot be stopped, but in the long and medium term, a strategy must be devised to manage seed introductions. The ITDAS station in Hassi Ben Abdallah is well suited to manage these introductions and assist farmers in choosing their seeds.

CONCLUSION

The agriculture of the 21st century must find a compromise between productivity and sustainability. Specific diversity is the most important: nature abhors homogeneity, and there are almost no mono-specific ecosystems on the globe, except in some extreme desert conditions. The first consequence of this species diversity is spatial heterogeneity, which translates into a great wealth of interfaces between species [6]. At the end of our work on the biodiversity of winter vegetable species, which was carried out in the development perimeters of the six communes of the Ouargla region, we found that the biodiversity recorded is 16 species and 09 botanical families, Numerous local cultivars have been identified; their identification is done mainly according to: the origin of the seeds, the shape and the color of the fruits.

The average richness and diversity indices of Shannon Weaver and equitability showed that the stations of Sidi khouiled and Hassi Ben Abdallah represent the most important diversity; those of Rouissat and Ouargla, with a diversity which seems to be weak. According to the interview established with farmers, the lack of certain species in the study area may be due to two reasons: either to a poor adaptation to the edapho-climatic conditions of the region, including temperature, salinity of water and soil, water insufficiency (case of Sidi Khouiled) on the one hand; and / or or disinterest of farmers to certain species in relation to the main crop which is the date palm and market demand.

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